EPA'S REVIEW OF REVISIONS TO
ILLINOIS' WATER QUALITY STANDARDS

Total Dissolved Solids Site-Specific Water Quality Standard
for the Lower Des Plaines River
(35 Ill. Adm. Code Section 303.445)[1]
Adopted February 15, 2007

DATE: OCT 3 0 2008

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[1] This submission is also documented and all electronic files are maintained in the Region 5 Water Quality Standards Tracking System (WQSTS) as submission number: IL2008-239. The proposed rules are documented as submission number: IL2006-155.

I. INTRODUCTION

On May 29, 2008, the Illinois Environmental Protection Agency (Illinois EPA) submitted a site-specific water quality standard (WQS) for Total Dissolved Solids (TDS) for the Lower Des Plaines River to U.S. Environmental Protection Agency for approval. EPA received a letter from the Illinois Attorney General on October 21, 2008, certifying that the rulemaking met all Federal and State legal requirements. This certification completed the requirements of State WQS submissions as specified in 40 CFR 131.6 and marked the official beginning of EPA's review responsibilities under 40 CFR 131.21 and section 303(c) of the Clean Water Act (CWA).

This review documents the basis for EPA's approval of the submitted state WQS rule revisions. **Part I** provides an introduction that includes EPA's review requirements under the CWA and EPA's consultation requirements under the Endangered Species Act (ESA). **Part II** provides a summary of the rule revisions adopted by the state, the history of the rulemaking, the basis for the state's rulemaking, and the data and rationale submitted by the state in support of the site-specific WQS revision. **Part III** contains EPA's action in this matter, including the basis for EPA's action and any expected environmental impact of the revised standard.

A. EPA's review for consistency with the CWA and federal regulations:

Water quality standards requirements under CWA sections 101(a)(2), 118, and 303(c)(2) are implemented through federal regulations contained in 40 CFR Part 131 and 40 CFR Part 132. Federal regulations at 40 CFR §131.21 require EPA to review and approve or disapprove new and revised water quality standards adopted by states and tribes. This authority has been delegated to the ten EPA Regional Administrators and, in Region 5, further delegated to the Director of the Water Division. In making this determination, EPA must consider the following requirements of 40 CFR §131.5.

- Whether state-adopted uses are consistent with CWA requirements;
- Whether the state had adopted criteria protective of the adopted uses;
- Whether the state has followed legal procedures for revising its standards;
- Whether state standards are based on appropriate technical and scientific data and analyses;
- Whether the state's submission includes certain basic elements as specified in 40 CFR §131.6, including use designations that are consistent with the provisions of sections 101(a)(2) and 303(c)(2) of the CWA; and,
- Whether the state submission meets the requirements of 40 CFR Part 132.

B. EPA's consultation requirements under the ESA

Consistent with section 7(a)(2) of the ESA, 16 U.S.C. §1536(a)(2), and federal regulations at 50 CFR Part 402, EPA is generally required to consult with U.S. Fish and Wildlife Service (FWS) and/or the National Oceanic and Atmospheric Administrations Fisheries Service (for marine species), on EPA actions that may affect federally-listed threatened or endangered species or designated critical habitat (generally referred to as "listed species" in the remainder of this document). EPA's approval of new and revised state WQS under section 303 of the CWA is generally an action requiring consultation where such approvals may affect listed species or designated critical habitat.

On June 6, 2008, EPA sent a letter to FWS requesting verification of the presence and location of federally-listed threatened or endangered species in the Lower Des Plaines River. This letter also briefly described the site-specific standard that Illinois had adopted and the need for informal consultation. During EPA's preparation of the Biological Evaluation for this action, it was discovered that no listed species were found in the action area. This confirms the analysis and conclusion reached by the Illinois Department of Natural Resources on December 19, 2005. This conclusion was confirmed by the FWS Chicago Illinois Field Office on October 23, 2008[2]. Extant populations of the Hine's Emerald Dragonfly are found in areas near the Des Plaines River, but all these locations are upstream of the segment in question. Similarly, populations of one wetlands plant species, the Eastern Prairie Fringed Orchid, are found within Will County, but none that would be affected by this site-specific TDS standard.

Therefore, EPA determined that approving this site-specific TDS standard will have no effect on listed species and further consultation with the FWS is not needed.

II. SUMMARY OF SUBMITTED WQS RULE REVISIONS

A. Description of the rule revisions

Under the conditions of a consent decree between EPA and ExxonMobil entered into on October 11, 2005, ExxonMobil was required to reduce air emmisions from its Joliet refinery. To comply with the concent decree, ExxonMobil installed wet gas scrubbers that resulted in increased concentrations of sodium sulfate in the wastewater discharge from the refinery. ExxonMobil is seeking a site-specific standard for TDS for the Lower Des Plaines River from 1500 mg/L upstream of the I-55 bridge and 1000 mg/L downstream of the I-55 bridge to1686 mg/L from the point of discharge to the confluence with the Kankakee River during the months of November through April. The existing standards cannot be met under winter low flow conditions because of high upstream TDS loads from road salting runoff which in itself results in

[2] Personal communication with Cathy Pollack at the Chicago Illinois Field Office of the U.S. FWS on October 23, 2008.

TDS levels above the current WQS. The specific rule language being added to the Illinois rules is shown below:

Section 303.445 Total Dissolved Solids Water Quality Standard for the Lower Des Plaines

a) Beginning November 1 and continuing through April 30 of each year, the total dissolved solids (TDS) water quality standard for Secondary Contact and Indigenous Aquatic Life Use waters in 35 Ill . Adm. Code 302.407 does not apply to the portion of the Des Plaines River from the ExxonMobil refinery wastewater treatment plant discharge point located at 1-55 and Arsenal Road (said point being located in Will County, T34N,R9E,S15, Latitude : 41', 25" North, Longitude : 88°, 11', 20" West) and continuing to the I-55 bridge . TDS levels in these waters must instead meet a water quality standard for TDS (STORET Number 70300) of 1,686 mg/L .

B. Beginning November 1 and continuing through April 30 of each year, the TDS water quality standard for General Use Waters in 35 Ill . Adm. Code 302 .208 does not apply to the Des Plaines River from the 1-55 bridge to the confluence of the Des Plaines River with the Kankakee River . TDS levels in these waters must instead meet a water quality standard for TDS (STORET Number 70300) of 1,686 mg/L.

Area Affected by the Site-Specific Standard

This site-specific standard pertains to the Lower Des Plaines River from the ExxonMobil refinery wastewater treatment plant discharge point located approximately 1000 feet east of 1-55 off of Arsenal Road (said point being located in Will County, T34N,R9E,S15, Latitude : 41', 25" North, Longitude : 88°, 11', 20" West) and continuing to the confluence of the Des Plaines River with the Kankakee River.

B. Rule development and submittal history

The proposed site-specific rulemaking was first filed with the Illinois Pollution Control Board (IPCB) by the ExxonMobil Oil Corporation (ExxonMobil) on February 7, 2006, for discharges of TDS from the ExxonMobil Joliet Refinery into the Lower Des Plaines River during the months of November through April in each year. A more complete description of this rulemaking can be found in the IPCB's opinion and order of March 2, 2006, in Docket R06-24. The IPCB adopted the proposed amendments for the purpose of first notice under the Illinois Administrative Procedures Act (APA) without commenting on the merits of the proposal, and granted the motion for expedited consideration.

On May 9, 2006, the IPCB published a Notice of Hearing. A Public Hearing was held on June 14, 2006, in Joliet Illinois. Comments from the petitioner and Illinois EPA were submitted. Illinois EPA submitted testimony and comments supporting ExxonMobil's site-specific rule proposal. On June 14, 2006, Stacey Ford (an employee of ExxonMobil and New Source Review Consent Decree Coordinator) and James Huff (a registered professional engineer) testified on behalf of ExxonMobil, and Scott Twait and Robert Mosher testified on behalf of the Illinois EPA.

On December 17, 2006, the IPCB issued an opinion and order for second-notice review by the Joint Committee on Administrative Rules (JCAR). In this opinion, the IPCB:

- delineated the procedural history of the rulemaking;
- as background, reviewed the operations and history at the Joliet Refinery as well as the consent decree requiring ExxonMobil to reduce air emissions;
- discussed the water quality in the relevant river segment and the expected impact of the rule on that stretch of water and on other dischargers;
- evaluated whether there are any technical feasible and economically reasonable alternatives to the proposed rule, and finally;
- considered input from Illinois EPA, Illinois Department of Natural Resources, and EPA.

On February 15, 2007, the IPCB issued an opinion and order and adopted the proposed amendments.

C. Basis for State rulemaking

ExxonMobil has asserted that because of occasional observed TDS violations in the Des Plaines River in light of 35 Ill. Adm. Code 302.102(b)(9), Illinois EPA could not issue the wastewater construction permit needed to comply with the air emissions consent decree. IPCB adoption of the proposed site-specific TDS standard would allow for issuance of an approvable permit. Illinois EPA concluded that the ExxonMobil Refinery and the water body segment met the requirements set forth in section 27(a) of the Illinois Environmental Protection Act for a site-specific water quality standard for TDS (415 ILCS 5/27(a), 2004).

D. Data and Rationale Submitted by the State in Support of the Site-Specific Standard

Illinois EPA provided testimony to the IPCB that contained the justification and basis for making this site-specific change to the TDS standard. As enclosures to the May 27, 2008, submission transmittal letter, Illinois EPA submitted the following documents regarding the development, proposal and adoption of this rulemaking:

- Copies of the Illinois Register publications of the proposed and adopted regulations dated March 17, 2006, December 14, 2006, and March 31, 2007;

- Copies of the IPCB's first notice opinion (March 2, 2006), second notice opinion (December 7, 2006) and adopting opinion (February 15, 2007) in R04-26, which detail the rulemaking process;
- A copy of the public notice for the June 14, 2006, hearing;
- A copy of the Petition for Site-Specific Regulation (with Exhibits 1-9);
- A copy of Illinois EPA's pre-filed testimony. This included information that the other dischargers to the Des Plaines River are not expected to have any substantial discharge of dissolved solids, and hence are not affected by the petition;
- A copy of the ExxonMobil's pre-filed testimony (with Exhibits 6A, 6B, 6C, 9, 10 and revised Exhibit 5);
- A copy of ExxonMobil's Response to Board's Questions;
- A copy of the transcript of the June 14, 2006, public hearing;
- A copy of JCAR's Certification of No Objection;
- A copy of JCAR's Request for Analysis of Economic and Budgetary Effects of this Rulemaking;
- A copy of Post-Hearing comments of ExxonMobil Oil Corporation;
- A copy of the Post-Hearing comments of Illinois EPA; and
- A copy of comments of Jeff Fort for ExxonMobil Oil Corporation.

The following discussion summarizes the derivation and justification of the site-specific TDS standard. It is based on Board testimony,[3] studies and data to support the revised sulfate standard,[4] supplemental information provided by Illinois EPA[5], and other studies[6].

> The existing General Use TDS standard of 1,000 mg/L and Secondary Contact and Indigenous Aquatic Life (SCIAL) standard of 1,500 mg/L date from the original IPCB WQS of 1972. The reasoning given for the 1,500 mg/L SCIAL standard was that "this equals the existing effluent standard" (since repealed - no TDS effluent standard now exists). The General Use standard was adopted based on the opinion of a Dr. Lackey and Mckee and Wolf (1963) (based on criteria developed for California) that "aquatic life should not be harmed". There was never any "calculation" of these standards in the modern sense, taking into account toxicity responses of several aquatic taxa.

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[3] IPCB (R06-24), Notice of Filing, May 31, 2006 contains pre-filed testimony from the Illinois EPA. Also includes quarterly the final report from Dr. David J. Soucek, (Illinois Natural History Survey), *Effects of Water Quality on Acute and Chronic Toxicity of Sulfate to Freshwater Bivalves, Ceriodaphnia dubia and Hyalella asteca*, April 20, 2006.

[4] Illinois EPA document, *Draft Justification for Changing Water Quality Standards for Sulfate, Total Dissolved Solids and Mixing Zones* (January 21, 2004).

[5] Email from Bob Mosher, IEPA to Edward Hammer, EPA Region 5 on May 29, 2006.

[6] Huff, J.E. (2005). Predicted Water Quality Impacts on the Des Plaines River from the Proposed Wet Gas Scrubber from ExxonMobil Joliet Refinery. 25pp.

Illinois EPA has been working on a revision of their WQS regarding TDS and the major ionic constituents for several years. Illinois EPA has concluded that since TDS is a compilation of several different ionic constituents, each having varying toxicity to aquatic life either individually or in combination, it is a poor parameter to base a standard on[7]. TDS as a criterion is even less significant when information is available from the major individual anionic constituents such as chloride and sulfate. For example, if TDS is due to high chloride levels, a TDS standard of 1,000 mg/L is reasonable. But if TDS is due to high sulfate levels and lower chloride levels, a TDS level of 3000 mg/L or more would be closer to the toxic threshold. Illinois EPA has proposed a revised sulfate standard which was adopted by the IPCB on September 4, 2008. This rule is in the process of being published in the Illinois Register for final adoption. As part of this rulemaking, the current TDS standard will be removed from the state's WQS for the reasons stated above and elsewhere in this document and Board proceedings.

EPA has reviewed the research studies and data that form the basis for the revised sulfate standard and believes that they have scientific merit and will be protective of aquatic life. To determine a site-specific TDS standard for the Lower Des Plaines River, Illinois EPA used the new sulfate toxicity data and coupled it with the exisiting chloride standard to calculate a protective level of TDS. The new (soon to be adopted) sulfate standard is as follows:

$$[1276.7 + 5.508(hardness) - 1.457(chloride)] \times 0.65$$

This formula will be used to set sulfate criteria levels on a site-specific basis based on site-specific hardness and chloride levels. The Lower Des Plaines has a hardness of 205 mg/L under critical conditions and the highest chloride value known to Illinois EPA is 450 mg/L. Using the above formula, the resulting sulfate standard would be 1138 mg/L. The sulfate and chloride in the river are overwhelmingly coupled with sodium, as is the case almost everywhere (calcium and magnesium have variously higher values elsewhere, but this would be reflected in the hardness value and thus would factor into the equation). Adding together just the two major anions (chloride and sulfate) results in a level of 1588 mg/L (450 + 1138). This in itself is essentially equivalent to the site-specific TDS standard of 1686 mg/L being proposed for the Lower Des Plaines River. Adding in the other major ions present, such as sodium, magnesium, and calcium would result in a TDS level much higher than the proposed standard. Illinois EPA estimated that the TDS equivalent value would be about 3,000 mg/L. The site-specific TDS standard of 1,686 mg/L being proposed for the Lower Des Plaines River is well below this calculated toxicity threshold of 3,000 mg/L.

[7] This conclusion has also been reached by several other researchers such as Mount, *et al.* (1997), Weber-Scannell and Duffy (2007), and Chapman, *et al.* (2000) to name a few.

Other reasons besides the TDS recalculation to support the need for a revised standards were also investigated and provided to the Board during their proceedings. It was asserted that the current TDS standard is neither technically feasible nor economincally reasonable as applied to the refinery and the construction project required under the Consent Decree, and that temporary storage and technical treatment options were either infeasible or cost-prohibitive. It was also asserted that snow-melt conditions and the resulting run-off of dissolved solids is responsible for the monitoring exceedances observed in the Des Plaines River, and so the request is seasonal in nature.

In many ways, this site-specific WQS for TDS will soon be a moot point since rulemaking is nearing completion that will adopt a revised standard for sulfate and delete the old outdated TDS standard from Illinois' rules. On September 4, 2008, the IPCB issued an Opinion and Order of the Board that adopts the sulfate and TDS rule amendments for final notice and directs the Clerk to file with the Secretary of State for publication in the Illinois Register for final adoption.

E. Discussion of Public Comments Made During this Rulemaking

The IPCB received prefiled testimony from Illinois EPA (Scott Twait and Robert Mosher) and ExxonMobil (James Huff and Stacey Ford) on May 31, 2006, and June 2, 2006, respectively which included ExxonMobil's responses to the IPCB's questions. The transcripts of the June 14, 2006, public hearings were received by the IPCB and placed on the Clerk's Office On-Line (COOL) website (www.ipcb.state.il.us).

On December 7, 2006, the IPCB published an Opinion and Order of the Board in which the Board adopted the site-specific revisions to the TDS WQS in the Lower Des Plaines River for second notice review by the JCAR. The Board conducted a public hearing on June 14, 2006, and received comments from the petitioner and Illinois EPA. Illinois EPA submitted testimony and comments supporting ExxonMobil's site-specific rule proposal. On July 5, 2006, the IPCB filed a notice with Illinois EPA's post-hearing comments in response to Board questions. EPA reviewed Illinois EPA's summary of the comments, and responses, and believes that Illinois EPA reasonably responded to the comments received.

III. EPA ACTION

A. CWA Section 303(c) / 40 CFR 131 Review

40 CFR 131.6 specifies the following six elements that must be included in each state's WQS submitted to EPA for review.

a) Use designations consistent with the provisions of sections 101(2)(2) and 303(c)(2) of the Act. The currently designated uses for the segment of the Des Plaines river relevant to this site-specific standard are not being changed. From the point of discharge (approximately 1000 ft. east of the I-55 bridge) to the I-55 bridge the use remains

Secondary Contact and Indigenous Aquatic Life. From the I-55 bridge to the confluence with the Kankakee River the General Use designation remains.

b) Methods used and analyses conducted to support water quality standards revisions. Illinois EPA submitted testimony to the IPCB, scientific studies, toxicological data and rationale as described above.

c) Water quality criteria sufficient to protect the designated uses. 40 CFR 131.11(b)(1) states that in establishing criteria States should establish numerical values based on (i) 304(a) Guidance; (ii) 304(a) Guidance modified to reflect site-specific conditions; or (iii) other scientifically defensible methods. EPA has never specifically developed 304(a) guidance for TDS. As such, and as described above, a scientifically defensible rationale was provided by Illinois EPA to justify the revised site-specific TDS standard. EPA agrees that the revised TDS standard for the Lower Des Plaines River is scientifically defensible, meets the requirements of 40 CFR 131.11(b)(1)(iii), and will continue to be protective of the designated uses for this stream segment.

d) An antidegradation policy consistent with §131.12. This item is not applicable since this site-specific standard will not affect Illinois' existing antidegradation policies.

e) Certification by the State Attorney General or other appropriate legal authority within the State that the water quality standards were duly adopted pursuant to State law. The certification from the Illinois Attorney General was received on October 21, 2008.

f) General information which will aid the Agency in determining the adequacy of the scientific basis of the standards which do not include the uses specified in section 101(a)(2) of the Act as well as information on general policies applicable to State standards which may affect their application and implementation. The information to support this site-specific standard submitted by Illinois EPA and the petitioner is described above.

EPA Action

EPA approves Illinois' revised site-specific standard for TDS for the Lower Des Plaines River (35 Ill. Adm. Code Section 303.445, Adopted February 15, 2007) under Section 303(c) or the CWA.

Basis for EPA's Action

The following is the rationale for EPA's approval of the site-specific TDS water quality standard for the Lower Des Plaines River.

- EPA has not developed a recommended national ambient water quality criterion for TDS for the protection of aquatic life. TDS is discussed in both the Red Book (EPA's water quality guidance from 1976) and Gold Book (1986)[8], but recommendations were only

[8] Red Book (*Quality Criteria for Water1976, PB-263 943, July 1976*) and Gold Book (*Quality Criteria for Water 1986*, EPA 440/5-86-001, May 1, 1986)

made for domestic water supplies (250 mg/L for chlorides and sulfates). This site-specific revision to a state WQS must therefore be scientifically defensible (40 CFR 131.11(b)(1)(iii)). EPA has reviewed the studies and data submitted by Illinois EPA in support of a revised sulfate standard and agrees with the scientific merit and conclusions reached by Illinois EPA. EPA agrees with Illinois' primary assumption that TDS toxicity to aquatic life is much better handled by setting criteria for the major, most toxic, ionic constituents such as sulfate and chloride. EPA further agrees with the scientific analysis and rationale provided by Illinois EPA and summarized above that the proposed site-specific TDS standard of 1,686 mg/L is protective of the designated uses for the Lower Des Plaines River.

- When Illinois EPA adopted the current TDS standards in the early 1970's, limited data were available and a conservative approach was taken. Since that time, however, several groups and researchers have investigated the water quality issues and have concluded that a substantiaally higher standard is warranted (Soucek, 2004). These investigations indicate that the current TDS standard of 1,000 mg/L is not necessary nor particularly meaningful to achieve the goal of protecting aquatic life.
- Finally, Illinois EPA has submitted a WQS rule revision to the IPCB that will revise the current sulfate standard base and will remove the current TDS standard as being irrelevant and unnecessary for the protection of aquatic life. This rulemaking has been adopted by the IPCB and should be published in the Illinois Register and sent to EPA for review within the next month or two.

B. Environmental Impact of the Site-Specific Standard.

Aquatic Life

As mentioned above, EPA has not developed a recommended national ambient water quality criterion for TDS for the protection of aquatic life. Some toxicity studies have been conducted although given the complexity and variability of TDS these data are difficult to summarize and use effectively. TDS is a measure of all constituents dissolved in water, including inorganic anions such as carbonates, chlorides, sulfates and nitrates, and inorganic cations such as sodium, potassium, calcium and magnesium. Many researchers have concluded that individual ions rather than TDS criteria are more appropriate to characterize toxicity related to TDS. Mount et al. (1997) states that the toxicity of fresh waters with high dissolved solids has been shown to be dependent on the species of ionic composition of the water. Integrative parameters such as conductivity, TDS, or salinity are not robust predictors of toxicity for a range of water qualities. This conclusion that different limits for individual ions, rather than a TDS limit, be developed to protect salmonid species was also made by Weber-Scannell and Duffy (2007). Chapman, et al. (2000) concludes that toxicity related to the individual ions in TDS is due to the specific combination and concentration of the ions and is not predictable from TDS concentrations. They also found no toxicity with embryos and developing fry at TDS concentrations above 2000 mg/L.

Considering the specific conditions of hardness, chlorides and other ions as discussed above for the Lower Des Plaines River it appears as if they toxicity threshold for aquatic life is above the adopted TDS standard of 1686 mg/L. In addition, this standard only applies during the winter months, thus not affecting the reproduction and early life stages of most aquatic species. Also, all known monitoring data shows that TDS levels rarely exceed the 1000 mg/L level and when this has happened it was attributed to salted road runoff in the winter.

Human Health & Wildlife

The TDS site-specific standard will have no effect on human health since there are no public water supply intakes along this stretch of the Des Plaines River. In addition, TDS components are not bioaccumulative and would not be expected to cause any impact on human health from fish consumption. Under the Safe Drinking Water Act, only secondary maximum contaminant levels (MCL) (for taste, ordor or aesthetic effects) were developed (250 mg/L for sulfate and 500 mg/L for TDS) and there are no primary MCLs[9].

This site-specific standard is also not expected to have any direct effect on wildlife. Although wildlife are potentially affected by revisions to aquatic life water quality criteria, there should be no direct effect on wildlife for many of the same reasons discussed above regarding aquatic life. In addition, and as mentioned above, the state is in the process of removing the TDS standard from their rules and replacing it with separate standards for the most important constituents, especially sulfate.

IV. LITERATURE CITED

Chapman, P.M., Bailey, H. and Canaria, E. (2000). Toxicity of Total Dissolved Solids Associated with Two Mine Effluents to Chironomid Larvae and Early Life Stages of Rainbow Trout. Environmental Toxicology and Chemistry, Vol 19(1):210-214

Huff, J.E., (2005). *Predicted Water Quality Impacts on the Des Plaines River from the Proposed Wet Gas Scrubber from ExxonMobil Joliet Refinery*. 25pp.

McKee, J.E., and Wolf, H.W. (1963). Water quality criteria (second edition). State Water Quality Control Board, Sacramento, California. Pub. No. 3-A.

Mount, D.R., Gulley, D.D., Hockett, J.R., Garrison, T.D., and Evans, J.M. (1997). Statistical Models to Predict the Toxicity of Major Ions to *Ceriodaphnia dubia*, *Daphnia magna*, and *Pimephales promelas* (Fathead Minnows). Environmental Toxicology and Chemistry, Vol. 16 (10): 2009-2019.

[9] See: 40 CFR §141 or http://www.epa.gov/safewater/contaminants/index.html

Soucek, D.J. (2004). Effects of Hardness, Chloride and Acclimation on the Acute Toxicity of Sulfate to Freshwater Invertebrates. Final Report submitted to the Illinois EPA and the Illinois Coal Association, January 9, 2004. 17pp.

Weber-Scannell, P.K. and Duffy, L.K.(2007). Effect of Total Dissolved Solids on Aquatic Organisms; A Review of Literature and Recommendation for Salmonid Species. American Journal of Environmental Sciences 3(1):1-6